The Economic Impact of Cancer in Texas

Part 1: Direct and Indirect Costs, 1998

Report to the Texas Comprehensive Cancer Control Coalition
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Executive Summary

The standard method for conducting a cost-of-illness study involves estimating the direct costs and indirect costs incurred in a particular year that are attributable to the condition under study. In this study we estimated the economic impact of cancer in Texas for the year 1998. Our calculations resulted in estimated direct medical costs of $4.8 billion and estimated indirect costs from lost productivity of $9.1 billion, for a total of about $13.9 billion attributable to cancer in 1998. Estimates are given in this report for four specific common cancers where the data allowed (colorectal, lung, breast, and prostate), and costs are broken out by Texas Public Health Region where possible.

Introduction and Purpose

U.S. national costs of cancer in 1993 were estimated at about $104 billion,[1] and cancer is estimated to account for about 10 percent of national health expenditures.[2] Costs have been increasing, due partly to growth and aging of the population and partly to medical price inflation. Costs also reflect changing services. Technological innovation has improved survival, but has also increased costs; expansion of screening programs has increased spending in hopes of longer-term cost savings, and a shift from inpatient to ambulatory treatments has reduced direct spending.[3] As the population ages, costs in the future can be expected to increase, although the ramifications of increased incidence due to aging of the population versus increased prevalence due to improved survival are unclear.[4]

Texas, with about 7.4 percent of the national population, might be expected to experience a proportionate share of the costs of cancer. However, in 1998, Texas had about 6.3 percent of the nation's new cancer cases and 6.3 percent of the cancer deaths.[5] Texas has a unique demographic structure, younger in age and with a large Hispanic population, which differs from much of the rest of the country. The behaviors of the population differ with respect to smoking, diet, and other influences on cancer incidence. Also, the health care system is not as fully developed and not as readily accessed as in many other areas of the country. Thus, evaluation of cancer costs in Texas is best constructed on the basis of information from within the state, and not simply calculated as a proportion of national costs. This report on the cost of cancer in Texas aims to estimate the direct and indirect costs of cancer in Texas in 1998. Besides the costs of cancer as a whole, costs are also broken out by four particular types of cancer, where possible: colorectal, lung, breast, and prostate.

Background

Evaluations of the economic consequences of diseases generally employ a cost-of-illness technique. The method includes estimates of direct and indirect costs of illness.[6] *Direct medical costs* reflect resources consumed by the health care system. Such costs may include hospital inpatient and outpatient services, ambulatory surgery, care by physicians and other practitioners, nursing home and home health services, drugs, rehabilitation services, and a variety of items such as prostheses, appliances, wigs, hearing aids,

and speech devices.[7] National studies suggest that direct medical costs account for about 24-35 percent of the costs of cancer.[8]

Indirect costs reflect lost productivity due to morbidity and mortality including work in and outside the home and time spent care-giving by family members and friends.[9] National studies suggest that about 65-76 percent of the costs of cancer are due to lost productivity, mainly from the loss of lifetime earnings due to premature mortality.[10] Estimates of future earnings lost to premature mortality are discounted to present value to reflect the time value of money and so the costs will be comparable to the direct costs.

The term "cost" refers to the economic value of all resources consumed or not produced as a consequence of an illness. Economists measure such resources in terms of "opportunity costs"—the value those resources would have generated in their next best alternative use.[11] While charge data have sometimes been employed for costing health care services, researchers agree that, in the absence of information on costs of production, actual payments better reflect the social opportunity costs of illness.[12]

Most cost-of-illness studies are prevalence-based, that is, they consider current costs of prevalent cases (usually within a certain year), rather than future costs of incident cases. For example, in a study that relied mainly on national data, Williams and Begley estimated Texas cancer costs in 1988 at $4.4 billion, compared to $2.4 billion in 1980.[13] The incidence-based approach, on the other hand, would consider new cases of illness and estimate the costs of the illness over patients' lifetimes.

Cost-of-illness studies convey the aggregate burden of illness on society, contribute to the setting of priorities for public investments,[14] and can serve to monitor trends. However, one should recognize that estimating costs of a disease is only a first step toward economic evaluation of a disease. While a cost-of-illness study can provide a picture of the overall dimension of a health problem and can serve to educate and to indirectly inform public policy, it does not provide information about potential effectiveness or benefits of interventions, information needed for rational allocation of resources.[15] While the cost of disease is important information, one must also know what can be done about it and the amount of resources required.[16] A beginning step toward more substantial economic evaluation of a disease is the incidence-based approach, which looks at the lifetime cost of a new case of the disease and provides base information that can be used in cost-effectiveness studies and in evaluating the potential for savings from prevention of cases.

While there is general agreement in the broad theoretical approaches to cost-of-illness studies, in practice, methodological details vary widely. For example, methods employed in studies of U.S. national diabetes costs have varied so extensively that reviewers have had great difficulty in comparing the respective findings.[17] Among the variations in methods for estimating the direct costs of a disease is the distinction between "top-down" and "bottom-up" approaches. In the former type of study, the researcher begins with global costs of all disease and tries to allocate costs between or among the respective diseases. In the latter type of study, the researcher is not concerned with global costs, and focuses instead on building a cost estimate for the disease of interest from information on expenditures or economic inputs.[18]

The methods for estimating indirect costs are described in the literature as using a "human capital approach." The approach values people in terms of their productive capacity. Obviously, that is only one limited perspective on the value of human life. An alternative approach called "willingness-to-pay" considers the amount which people might be willing to pay to reduce or avoid probability of illness or death from a disease. While attractive from a theoretical perspective, the method is rarely employed because of the practical limitations of generating appropriate data.[19]

We should note that, in addition to direct and indirect costs of disease, there also are psychosocial costs such as pain, suffering, loss of self-esteem, and emotional issues for those afflicted and their loved ones associated with disease. Such costs are generally acknowledged, but rarely measured. Also, in Appendices A and B, we provide information on two alternative approaches to measuring some of the costs of cancer. The first of these (Appendix A) is based on the U.S. Medical Expenditure Panel Survey, or MEPS. The second (Appendix B) is based on the Smoking-Attributable Mortality, Morbidity, and Economic Costs, or SAMMEC, software program developed by the Centers for Disease Control and Prevention.

Methods

We employed a "bottom-up" approach to measuring the costs of cancer in Texas in 1998 by estimated the costs for various components. For direct costs, we estimated costs of hospitalization, inpatient physician services, outpatient care and freestanding cancer treatment centers, emergency services, home health and hospice care, cancer screening, retail pharmaceuticals, and expenditures of state agencies, non-profit groups, and private foundations. For indirect costs, we estimated current year costs of lost productivity due to illness and disability, and the present value of lost future productivity due to current year mortality.

Direct Costs

Due to the unavailability of some data and lack of consistency in others, we had to employ a variety of different methods in calculating the various facets of direct costs. The methods used are broken out below by specific component, as different data sources and methodologies were used for each one.

Hospitalization: Information on hospital utilization by cancer patients came from a database compiled by the Texas Health Care Information Council (THCIC), and from supplemental data supplied by the Texas Medicaid program. The THCIC hospital database contained records for each hospital stay at most Texas hospitals, including rehabilitation hospitals, during the period from January through March, 1999. Hospital stays with a principal diagnosis of cancer (ICDs 140-239) were viewed as *directly attributable* to cancer. Stays with another principal diagnosis, but having cancer among any of eight secondary diagnoses, were viewed as *indirectly attributable* to cancer. The two types of stays combined were viewed as *total stays attributable* to cancer.

All hospital stays which were attributed to cancer were further examined to determine whether any of four specific types of cancer were present among the diagnostic codes: colorectal (ICD 153-154), lung (162), breast (174), and prostate (185). To avoid double-counting, when records contained diagnostic codes for

more than one kind of cancer, including types of cancer other than the four types of interest, priority was given to the type of cancer listed earliest among the nine possible diagnostic codes.

For cancer stays at seven children's hospitals, charge information was adjusted by Medicaid cost-to-charge ratios for 1998, including discount factors, to obtain an estimate of cancer costs. For all other hospitals, costs were estimated by multiplying the Medicaid Adjusted Standard Dollar Amounts (ASDA) and the Medicaid DRG Weights. The Medicaid ASDAs are based on hospital-specific analyses of average patient costs. The DRG weights adjust for differences between types of patients. A handful of hospitals were not Medicaid contractors and, for these, the Standard Dollar Amounts (SDA), unadjusted for Medicaid contractual discounts, were applied to the Medicaid DRG weights. Fifty-four cancer-related stays in the database had DRGs with a weight of zero and, for those stays, costs were estimated on the basis of the average cost among stays for persons having the same type of cancer (colorectal, lung, breast, prostate, other).

Because information was available for only one calendar quarter, the number of hospital stays and the associated cost estimates were annualized by multiplying by a factor of four (thus assuming that the quarters were equal, since cancer incidence is not very seasonal). Attention was given to place of residence of the respective patients in order to distinguish between hospitalizations of Texas residents and non-residents. Also, the THCIC database did not include information for about 6 percent of the non-federal hospital beds in Texas. No adjustment was made for the missing data because such beds were in small community hospitals which were unlikely to have large numbers of cancer patients.

Based on the one calendar quarter of information from the THCIC database, we also calculated the annualized distribution of hospital stays and inpatient facility costs for cancer by Texas public health region. Costs were assigned to the various regions based on the residential zip codes of the patients in the database. Cancer cases were included in the table whether listed as principal or among secondary diagnoses, and care was taken to count only the first-listed cancer in situations where multiple cancers were present.

Inpatient Physicians: There were no direct measures available for the cost of physician services to treat persons hospitalized with cancer. Thus, alternative sources of indirect information were considered. Data from the 1996 U.S. Medical Expenditure Panel Survey (MEPS) suggest that inpatient physician costs for cancer patients were about 11 to 12 percent of inpatient facility costs. However, these data have limitations in their application to Texas (see Appendix A for details). Researchers in California report that the figure is about 15 percent using data from the U.S. National Medical Care and Expenditure Survey (NMCES).[20] In an earlier study of the Medicare program with matched records for inpatient facility and physician services, researchers reported that costs of inpatient physician services amounted to about 16 percent of hospital costs.[21] These two studies examined costs among all patients and did not focus on cancer patients.

Currently underway is a national analysis of Medicare patients using matched billing records for inpatient facility and inpatient provider costs. This analysis examines provider/facility reimbursement ratios for each of the various DRGs.[22] The 25 most common DRGs among cancer patients within the THCIC

inpatient database accounted for about half of the hospital stays among cancer patients, and the provider/facility cost ratios for those DRGs, taken from the national Medicare analysis, ranged from 5.2 to 36.9 percent (see Appendix D for details). We averaged the various ratios while weighting the data for the number of inpatient stays among cancer patients under each DRG within the THCIC database and also weighting for the Medicaid Adjusted Standard Dollar Amounts. This procedure yielded a weighted average ratio of 21.6 percent, and this figure was applied to the Texas estimate for inpatient facility costs among cancer patients.

Outpatient Treatment and Freestanding Cancer Centers: Calculating the cost of the considerable amount of outpatient treatment that occurs in the state is very difficult, as this occurs in a variety of settings—hospitals, doctors' offices, and freestanding cancer centers—and there is not a centralized source for data. We use several indirect and partial measures to estimate the costs of outpatient treatment. These include the Medical Expenditure Panel Survey (MEPS) data presented in Appendix A, estimates based on data provided in the 10-K of U.S. Oncology regarding 1998 revenue of Texas Oncology, P.A., and M.D. Anderson data that we adjusted to estimate net outpatient treatment expenses. The MEPS data is based on adjusting a national sample and it measures attributable costs of cancer in Texas, which means the additional costs that persons with cancer incur relative to the general population. For the purpose of measuring outpatient costs we added together the total costs of the following categories: hospital outpatient facility, hospital outpatient provider, and office-based physician and non-physician.

The one data source that we had available that covered non-inpatient hospital care across the state was provided by the S.E.C. Form 10-K for 1999 for U.S. Oncology, who owns a number of freestanding cancer centers in Texas and in other states. According to this report one physician group, Texas Oncology, P.A., contributed 32 percent (equaling $237.7 million) of U.S. Oncology's total revenue in 1998, which was $836.6 million. This figure includes "pharmaceuticals and supplies used by affiliated physician's groups, salaries, wages and benefits of the affiliated physician's groups employees (excluding affiliated physicians) and the company's employees located at affiliated practice sites and business offices and other practice costs," as well as corporate profits.[23] It does not include physician compensation and benefits or, in 1998, professional liability costs. After review of the data and speaking with several oncologists and others, we determined that physician compensation and benefits including professional liability coverage was probably about 25 percent of the total, or one-third of the other costs. This generated total costs for Texas Oncology for 1998. Of the 30 freestanding cancer centers in Texas in 1998, the companies that merged to form U.S. Oncology (in 1999) owned 13 of these in 1998. Ten centers were owned by Physician Reliance Network (PRN) and Texas Oncology, P.A., and three centers were owned by American Oncology Resources (AOR).[24]

Assuming Texas Oncology, P.A., represents 25 percent of the revenue of all outpatient cancer treatment in the state, we multiplied our 1998 estimate for Texas Oncology by four to generate an estimate of the total outpatient costs in Texas. This may include some inpatient billings for procedures such as bone marrow treatments, chemotherapy, or radiation treatments, but it probably excludes radiation treatment by physicians not part of oncology practices, and care by urologists, OB-GYNs and other practitioners involved in outpatient cancer care.

As a third measure to see if our estimates were in the "ballpark" we disaggregated data on M.D. Anderson Cancer Center. In 1998, M.D. Anderson in Houston admitted 15,920 patients and had 368,605 clinic visits. In order to estimate outpatient clinical expenses we took the 1998 total M.D. Anderson expenditures ($779,006,782[25]), subtracted the inpatient hospital estimate from the THCIC data ($248,115,000[26]), subtracted total research costs ($115,225,532[27]), and added in 60 percent of the M.D. Anderson practice plan expenditures ($65,069,084[28]). The M.D. Anderson numbers may be somewhat inflated by non-Texans, but those from outside of Texas are certainly a lower percentage than they are of inpatients. On the other hand, some of the research expenditures are for clinical trials and clinical treatments, which probably should be included.

Emergency Services: We were unable to locate a Texas-based source of information on the cost of emergency services. Our estimate, therefore, was based on the ratio of emergency room facility and physician costs to inpatient facility costs as calculated from the U.S. Medical Expenditure Panel Survey. Costs of emergency services were small—less than 1 percent of inpatient facility costs (see Appendix A for details on MEPS).

Home Health Care: To calculate this cost we obtained an estimate from the Health Care Financing Administration (HCFA) on the amount spent by all payers in Texas in 1998 for home health care ($2,862,000,000).[29] In the absence of Texas-specific data on home care costs and use by cancer patients, we obtained national data from the National Association for Home Care (NAHC) that showed that 8.3 percent of people discharged from home health care had malignant neoplasms (ICD-9-CM codes 140-208, 230-234) listed as their primary diagnosis in 1995-1996 (we could not obtain later data but it is reasonable to assume the diagnoses would not change much within two years). In absence of specific data breaking out costs of home care by different diseases, we had to assume that people using home health due to cancer incur average costs that are similar to those due to other diseases, so we applied the 8.3 percent figure to the total amount spent on home health care in 1998 to get an estimate of the cost of home health care due to cancer. According to the NAHC, breaking this percentage down further by types of cancer produced numbers too small to be reliable (cancer is not in the top ten diagnoses of Medicare recipients using home health care after hospitalization).[30]

There is a chance that part of the home health care cost estimate overlaps with the hospice care estimate described in the next section (it would be the part pertaining to costs of hospice care administered by a home care organization). HCFA pays for home health as a separate benefit from hospice, but many home health care agencies could offer both of these services and could bill for both, and the cost data available on "home health" does not allow us to determine exactly what costs are used to comprise this.

Hospice Care: We obtained data from the NAHC that showed that for all hospices in Texas, total charges in 1997 were $156,605,000 and total reimbursements were $154,796,000 (from Medicare, Medicaid, or private insurance).[31] This data also showed that malignant neoplasms (ICD-8-CM codes 140-208, 230-234) were the primary admission diagnosis of 69.7 percent of hospice patients nationwide in fiscal year 1996. Colorectal cancer (codes 153-154) was not broken out of this percentage, but three other cancers were: malignant neoplasms of the trachea, bronchus, and lung (codes 162, 197.0, 197.3) accounted for 21.9 percent of primary diagnoses; breast cancer (codes 174-175, 198.81) was 4.4 percent,

and prostate cancer (code 185) was 3.3 percent.[32] The diagnosis data are from one year earlier than the patient and financial data (which is one year earlier than our target year of 1998), but we would not expect much change in these figures in this short time frame. The diagnosis percentages are on a national level, but lacking state-level data, we assumed that hospices in Texas had similar admission diagnoses in 1998 and that these patients had costs similar to those receiving hospice for other conditions. We therefore applied the percentages of cancer admissions to the total reimbursements for an overall estimate of the cost of hospice care due to cancer, then applied the percentages due to lung, breast, and prostate cancers to arrive at an estimate of costs due to those specific cancers.

Cancer Screening: It is difficult to obtain accurate figures for routine screening tests since they are usually done along with a regular physical examination and are not reported anywhere as they occur. Therefore, statistics on these tests are usually obtained from periodic surveys of people's health-related behaviors, and thus depend on the accuracy of their recall of past events. To obtain estimates of the costs of common cancer-screening procedures performed in 1998, we multiplied an estimate of the number of people who received each screening test by the estimated cost of each procedure to get a total for each procedure, then added these together to get the overall cost of screening. Due to unavailability of data, these screening costs do not include costs of follow-up testing and procedures (such as biopsies) that may be indicated by true or false positives, nor costs of any complications arising from screening or follow-up tests. Although lung cancer is very prevalent and often fatal, there are no widely accepted screening tests for lung cancer and screening is not routinely done, so costs are not included in this section. Note that there was no way to distinguish between instances in which these tests were given for screening purposes (in asymptomatic people) and those that were given for diagnostic purposes (when cancer is suspected). Since the purpose of all of these tests is early detection, we referred to them all as "screening," though some may have been considered "diagnostic" when administered.

The screening costs analyzed are mammograms for breast cancer detection; Pap smears for cervical cancer; prostate-specific antigen (PSA test) for prostate cancer; and fecal occult blood test (FOBT), sigmoidoscopies, and colonoscopies for colorectal cancer. The average costs for each were obtained from various sources as noted in the findings section. The numbers of people screened were based upon random-sample surveys of people in Texas saying that they had the procedure in question within the past year (except for colonoscopies), and were obtained from the American Cancer Society (except the PSA numbers), who calculated them from state and national sources.[33]

The data from the American Cancer Society were given in percentages only, so we multiplied these by the appropriate subgroups of the Texas population in 1998 (the question on Pap smears was asked to women aged 18 and over, mammograms and clinical breast exams to women 40 and over, and the colorectal screening questions to both men and women 40 and over).[34] The PSA screening numbers (percentage and estimated number of men screened in Texas) were obtained from unpublished results from the Texas Department of Health's 1999 Texas Behavioral Risk Factor Surveillance System survey (BRFSS). The percentages of people screened using mammograms, clinical breast exams (we reported this number but could not obtain cost estimates), and Pap smears were for 1998, while the percentages screened using FOBT and sigmoidoscopies are for 1997 (though they were applied to the 1998 population). The

numbers receiving colonoscopies are estimated based on numbers from 1996, and the PSA screening numbers are from 1999, as the survey question was not asked in 1998.

We could not locate Texas-specific statistics on the annual number of colonoscopies but wanted to include this as the costs can be significant, so we estimated costs for this procedure as follows. There were about 1,395,000 colonoscopies in the U.S. in 1996 (1998 data was not available).[35] Texas had about 7.2 percent of the U.S. population in 1996,[36] so we assumed that Texas had 7.2 percent of the colonoscopies, or 100,440. Since Texas has a younger average population than some states and colonoscopy is recommended after age 50, this number may be too high, but since the number surely increased in 1998 as Medicare began covering screening colonoscopies that year (diagnostic and surveillance colonoscopies were already covered), this should balance out and provide a reasonable estimate for 1998. Cost estimates can vary greatly, so we picked an average cost and multiplied this by the estimated number in Texas to obtain estimated colonoscopy costs for 1998. Since the survey question on the BRFSS regarding sigmoidoscopies actually asked if the person had had a "sigmoidoscopy or proctoscopic exam" within the last year, we calculated the estimated number of people who had these from the percentages and then subtracted the estimated number who received colonoscopies (calculated above) to arrive at the number for sigmoidoscopies, so those who received colonoscopies instead of sigmoidoscopies were not double-counted because of the wording of this question.

Retail Pharmaceuticals: To help estimate the cost of retail pharmaceuticals in Texas used to treat cancer and related side effects, we contracted with the Center for Pharmacoeconomic Studies within the College of Pharmacy at the University of Texas at Austin to analyze data from the Texas Medicaid Vendor Drug Program (the Center has data use agreements with the Vendor Drug Program to conduct routine reporting and analytical services on Texas Medicaid pharmacy claims data). The Center for Pharmacoeconomic Studies provided data regarding payments for retail pharmaceuticals obtained by cancer patients with Medicaid drug benefits in 1998, both for oncology drugs used to treat cancer and for drugs commonly used to treat related side effects such as nausea (we determined that it was not relevant to include the costs of additional drugs used by these patients that were prescribed for conditions not related to cancer or treatment side effects, as these probably would have been used by these patients even in the absence of cancer).

The specific groups of costs that make up the estimate of all relevant retail pharmaceuticals used by cancer patients on Medicaid in 1998 are the following: [1] the cost of all oncology drugs paid for by the Vendor Drug Program; [2] the costs of all drugs used to treat side effects that were obtained by anyone who also obtained an oncology drug under this program (i.e., the population in group 1); and [3] the cost of all drugs to treat side effects obtained by people who did not obtain their oncology treatment drugs through the Vendor Drug Program (i.e., they obtained their cancer drugs directly from a doctor's office or hospital, so they were not included in group 1). This third group was identified by extracting medical claims from the Medicaid medical service utilization database based on relevant ICD-9 codes of any cancer and subtracting group 1 to get those who had cancer but who did not obtain oncology drugs (only obtained related drugs) through the Vendor Drug Program.

Once we had the costs for retail cancer and related pharmaceuticals for the population eligible for Medicaid pharmaceuticals and the total number of cancer patients that had obtained these drugs on a retail basis, we divided the costs by the population to get a per capita estimate of how much an average cancer patient and/or his or her insurance company might pay for retail pharmaceuticals, in addition to the medications obtained in other settings. We then multiplied this average cost by the total population in Texas that was undergoing cancer treatments in 1998, for which we used 200,000 as a proxy (calculated by using the number of people hospitalized with any cancer diagnosis in the first quarter of 1999—50,349 patients, according to THCIC hospital data—and rounding off and multiplying by four to equal one year, assuming that almost all of these people would need additional cancer treatment before or after hospitalization). This number could be considered too low, as it does not reflect people hospitalized previously or not hospitalized at all who were receiving treatment, and because our calculations in the indirect costs section estimate that 247,000 people were considered disabled due to cancer in Texas in 1998 (see Table 3), but it could also be inflated in that it could contain multiple hospital admissions by the same person in one year, so these factors probably balance out and make this a reasonable proxy. Multiplying this proxy by the average per capita cost of relevant pharmaceuticals under Medicaid gave us an estimate of the total cost of retail cancer-related pharmaceuticals in Texas in 1998 for all cancer patients. This is not intended to be an estimate for *all* pharmaceutical products used by cancer patients in Texas; cancer drugs provided in inpatient and outpatient settings are billed by those facilities outside of the Vendor Drug Program and are already captured in other sections of this report.

State Agency Budgets: To calculate the portion of state agency budgets that is cancer-related, we first went to the online reference guide on the Texas Health and Human Services Commission's webpage and searched by the keyword "cancer."[37] The results of this search were seven programs, all within the Texas Department of Health (TDH). We contacted the TDH Budget Department to obtain the 1998 budgets for these cancer-related programs, which were the Cancer Registry Division (in the Bureau of Epidemiology), the Breast and Cervical Cancer Control Program, the cancer prevention component of the Chronic Diseases Community and Worksite Wellness Division, the cervical cancer component of the Maternal Health Program, the Medical Transportation Program (has cancer transportation programs in seven Texas counties), the Prostate Cancer Education Program, and the tobacco portion of the Bureau of Disease, Injury, and Tobacco Prevention. The Texas Cancer Council is not under the Health and Human Services Commission's umbrella, so we contacted them separately to obtain their budget for fiscal year 1998. We then added all of these budgets to obtain a total for fiscal year 1998.

This total is a conservative estimate for state agencies as there are probably other programs that deal with aspects of cancer control and prevention, such as nutrition, health education, asbestos control, and other environmental factors. To the extent that some of the programs included in this section provide screening procedures directly, there could be some double-counting between these and the costs calculated in the screening section of this report, but we cannot break these out with the current data and any cost overlaps should be small relative to the overall cost estimates.

Nonprofits and Foundations: Non-profit organizations and foundations play a large role in funding research and in cancer treatment and management for some individuals; however, it is extremely difficult to calculate the overall financial contribution of these entities. We did research at the Regional

Foundation Collection at the library of the Hogg Foundation for Mental Health, and found that there are 124 foundations in the state of Texas that fund cancer research and/or treatment in some capacity. It is difficult to calculate the financial impact of these organizations in a single year due to various reasons, one of which is that grant-making foundations usually do not focus on only one cause. Secondly, grants are often given to hospitals or large organizations whose budgets are already included elsewhere in this study, e.g., M. D. Anderson Cancer Center received over $45 million in cash gifts, pledge gifts, and in-kind gifts for their 1997-98 fiscal year.[38] To include this amount in total direct costs of cancer would be double-counting the dollars already included for the M. D. Anderson expenditures and practice plan. Finally, many grant-giving organizations have yet to compile and release lists of 1998 grants and budgets.

In light of these issues and after reviewing the large list of Texas foundations, we decided it was best for this study to include only a few of the non-profits and foundations with a large presence in Texas whose sole purpose is to serve cancer patients and survivors. These include the Lance Armstrong Foundation, the Susan G. Komen Foundation, and the Texas Division of the American Cancer Society. To obtain their financial information we contacted each of these organizations separately and asked for their fiscal year or calendar year 1998 budgets.

Indirect Costs

Indirect costs reflect lost productivity due to morbidity and mortality including work in and outside the home and care-giving by family members and friends.[39] While mortality cost estimates are based on how many people died in the year being studied, morbidity costs are based on how many people were sick during that year.

Morbidity: We estimated the number of people in 1998 with a history of cancer diagnosis and, among those, the number with employment or housekeeping disability where cancer was the main cause. Figures were developed by aggregation of records from the National Health Interview Surveys for years 1987-1996. Counted among the disabled were three groups of individuals: (1) People ages 18-69 who were unable to work were valued according to national earnings estimates for 1997 by gender and age plus an adjustment of 18 percent for fringe benefits, with further adjustment for labor force participation rates. (2) People ages 18-69 who were employed, but with work loss days in the past two weeks due to cancer, were similarly valued, except no adjustment was made for labor force participation. (3) Other people ages 18-69 were evaluated according to imputed values for housekeeping services with adjustment for the proportion of the population which engaged in housekeeping and were not otherwise in the labor force.[40]

All calculations were specific to age and gender groups. Findings from the stratified (age, gender, and ethnicity) national sample were applied to the Texas demographic structure for 1998. The ethnic groups in the national sample were constructed as follows: Hispanic (excluding Cuban and Puerto Rican origin), Black, and White/Other. National cost values for 1997 were inflated to 1998 on the basis of the nominal increase in average weekly wage for the U.S., and then adjusted downward to Texas on the basis of median household income.

Mortality: Counts of deaths due to cancer in 1998 were obtained from the Texas Cancer Data Center, and estimates of years of life lost were based on life tables for Texas.[41] Each cancer death was assumed to incur lost wages, fringe benefits, and value of housekeeping services from year of death up to average life expectancy in Texas. Figures were calculated for 5-year age groups and by gender, and were adjusted by labor force and housekeeping participation rates. Calculation of present values employed a 3 percent discount rate and an adjustment for annual productivity increases of 1 percent.[42] As was done for estimates of disability costs, adjustments were made to apply national cost figures for 1997 to Texas in 1998. Detailed findings are provided for each of the Texas public health regions.

Items Not Included

Many of the direct and indirect costs of cancer are difficult or impossible to locate or to put into monetary terms and thus are not tabulated in this report. No costs are included in this study for removal of small non-melanoma skin cancers in doctors' offices because this is not tracked by the Texas Cancer Registry or anyone else (only melanoma is required to be reported). This is a very common procedure though probably not a significant cost issue. Costs for rehabilitation are included in the inpatient and outpatient sections if services took place in those settings, but there are probably other rehabilitation costs that we were unable to obtain. Nursing home costs are not included because we cannot obtain accurate data on diagnoses or costs of nursing home patients due to cancer. The THCIC hospital database contains data on how many people were discharged to skilled nursing facilities from hospitals, but we do not know how long they remained in nursing homes, and this does not capture people who entered in previous years or who were not first hospitalized. Also, our analysis does not include incidental costs of prostheses, appliances, special diets, clothing, or wigs unless those items were bundled into the direct costs of health care.

Local agency budgets for cancer-related activities are not included because there are thousands of municipalities in Texas and hundreds of counties, and activities funded by state agencies and some foundations and non-profits would be picked up in other sections of this report as well as total screenings (so this omission could offset any double-counting between screenings and the state agency budgets). Also, this report does not include information on military or veterans' hospitals. Other costs not included are costs of lost work by family members and friends who must care for those with cancer and home modifications to accommodate disability. Psychosocial costs among patients and their families, e.g., pain and suffering and impaired relationships, are also not included. All of these are valid costs but are virtually impossible to measure, especially on an aggregate level.

Findings: Direct Costs

Hospitalization

Of approximately 2.44 million hospital stays in Texas in 1998, about 214,000 (8.8 percent) had cancer listed among the discharge diagnoses. Among the stays associated with cancer, about 201,000 (94 percent) were hospitalizations of Texas residents. The estimated cost of treating patients with cancer exceeded $2.0 billion, of which $1.85 billion was for Texas residents. The estimated cost of treating Texas residents was similar to an estimate constructed from the national Medical Expenditure Panel Survey (MEPS)—see Appendix A for details.

Among the Texas hospitals, M.D. Anderson Cancer Center had the most discharges of Texas residents with cancer—8,612 with an estimated cost of $142 million. The next three hospitals with the most resident cancer patients were in Dallas (Baylor), Houston (Methodist), and San Antonio (Southwest Texas), which together had about 14,700 discharges of Texas residents with cancer with a total cost of $176 million. Of the 383 facilities in the Texas Health Care Information Council's database, half of the resident cancer-related discharges were from the 41 facilities serving the most cancer patients, and these accounted for 55 percent of the total cost. Using the same methods, the estimated hospitalization costs for specific cancers were $161.4 million for persons with colorectal cancer, $228.0 million for lung cancer, $91.3 million for breast cancer, and $98.2 million for prostate cancer. Table 1 breaks down these costs by public health region (see Appendix C for regional map), and more detailed information, including breakdowns by age and ethnicity, is available in the supplementary report on inpatient cancer costs in Texas.

Table 1. Estimated Cancer Hospitalizations and Facility Costs by Public Health Region of Residence, Texas, 1998

Region		All Cancers	Colorectal	Lung	Breast	Prostate	Other
1	Hospital Stays	7,180	404	640	384	424	5,328
	Cost (x $1,000)	$58,488	$4,686	$5,866	$2,692	$3,146	$42,098
	% of Total Cost	3.2%	2.9%	2.6%	3.2%	3.2%	3.3%
2	Hospital Stays	6,384	432	872	240	396	4,444
	Cost (x $1,000)	$60,589	$5,658	$8,383	$2,059	$2,774	$41,715
	% of Total Cost	3.3%	3.5%	3.7%	2.4%	2.8%	3.3%
3	Hospital Stays	50,700	3,320	5,508	2,728	3,012	36,132
	Cost (x $1,000)	$488,346	$43,412	$63,018	$23,030	$24,735	$334,151
	% of Total Cost	26.6%	26.9%	27.7%	27.2%	25.3%	26.4%
4	Hospital Stays	11,632	1,016	1,584	600	876	7,556
	Cost (x $1,000)	$105,550	$12,336	$16,583	$3,909	$6,216	$66,506
	% of Total Cost	5.7%	7.6%	7.3%	4.6%	6.3%	5.3%
5	Hospital Stays	10,852	848	1,564	600	1,072	6,768
	Cost (x $1,000)	$92,888	$9,481	$14,845	$3,697	$7,355	$57,509
	% of Total Cost	5.1%	5.9%	6.5%	4.4%	7.5%	4.5%
6	Hospital Stays	47,808	3,128	5,124	2,580	2,800	34,176
	Cost (x $1,000)	$474,219	$38,979	$55,966	$22,536	$21,835	$334,902
	% of Total Cost	25.8%	24.1%	24.6%	26.6%	22.3%	26.5%
7	Hospital Stays	18,936	1,260	2,072	1,104	1,244	13,256
	Cost (x $1,000)	$163,322	$15,424	$20,167	$7,881	$8,937	$110,914
	% of Total Cost	8.9%	9.5%	8.9%	9.3%	9.1%	8.8%
8	Hospital Stays	18,460	1,080	1,816	1,160	1,284	13,120
	Cost (x $1,000)	$160,769	$12,544	$17,983	$8,464	$8,392	$113,385
	% of Total Cost	8.8%	7.8%	7.9%	10.0%	8.6%	9.0%
9	Hospital Stays	5,500	280	588	228	392	4,012
	Cost (x $1,000)	$49,367	$3,500	$5,983	$1,766	$3,006	$35,111
	% of Total Cost	2.7%	2.2%	2.6%	2.1%	3.1%	2.8%
10	Hospital Stays	7,052	388	588	384	500	5,192
	Cost (x $1,000)	$60,740	$4,808	$5,531	$2,578	$4,221	$43,601
	% of Total Cost	3.3%	3.0%	2.4%	3.0%	4.3%	3.4%
11	Hospital Stays	16,284	1,120	1,588	988	1,164	11,424
	Cost (x $1,000)	$122,558	$10,840	$13,390	$6,013	$7,313	$85,002
	% of Total Cost	6.7%	6.7%	5.9%	7.1%	7.5%	6.7%
Total	Hospital Stays	200,788	13,276	21,944	10,996	13,164	141,408
	Cost (x $1,000)	$1,836,836	$161,668	$227,715	$84,625	$97,930	$1,264,894
	% of Total Cost	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: McCandless, Li, and Warner, "Hospital Inpatient Costs of Cancer in Texas."
Note: Totals exclude hospitalizations with place of Texas residence unknown.

Inpatient Physicians

The costs for surgeons and other inpatient physicians are billed separately from other services received while a cancer patient is hospitalized. Using the benchmark that the cost of inpatient physician services was about 21.6 percent of the cost of inpatient facility care, we estimated that the cost of inpatient physician services was about $408.2 million for Texas residents hospitalized with cancer in 1998. (For

comparison, the estimate from MEPS was about $217.0 million—see Appendix A.) Using the same ratio, estimated costs of inpatient physician services were $34.9 million for persons with colorectal cancer, $49.3 million for lung cancer, $19.7 million for breast cancer, and $21.2 million for prostate cancer.

Outpatient Treatment and Freestanding Cancer Centers

Outpatient cancer treatment can take place in hospitals, doctors offices, and freestanding cancer centers that only do outpatient cancer treatment. There were 30 freestanding cancer centers in Texas in March of 1998 (see Appendix E).[43] These cancer centers include both non-profits and proprietary companies and provide chemotherapy, radiation treatment, and other cancer-related services. We obtained the number of patients served by 18 of the centers in 1998 from the Texas Cancer Registry and five more directly, for a total estimate of 21,258 patients seen in 23 out of the 30 centers in 1998 (though some of these are duplicated).

The Medical Expenditure Panel Survey data yielded estimates of attributable costs for outpatient treatment of cancer for both persons who had any cancer history and for those with any non-benign cancer history. The table below summarizes these estimates. Adding the totals for hospital outpatient facility, hospital outpatient providers, and office-based physicians and non-physicians gave a total of $1.228 billion for persons with any cancer history and $1.037 billion for persons with any non-benign cancer history (see Appendix A for details). These estimates, as discussed in Appendix A, are an attempt to adjust a national sample to Texas and are not grounded in Texas data. This shows "attributable costs," which are different than the "actual cost" approach that we are taking.

One approach to generating a Texas estimate is to project the 1998 data from U.S. Oncology regarding Texas Oncology, P.A., to account for the whole state. The Texas Oncology, P.A., revenues for 1998 were $267.7 million. Assuming that physician's compensation and benefits and professional liability costs were 25 percent of the total (or 33 percent of the other revenue), then the total Texas Oncology revenue in 1998 equaled about $356.9 million. If we assume that Texas Oncology revenue was approximately 25 percent of total Texas outpatient cancer treatment costs, this yielded an estimate of $1.427 billion in Texas in 1998.

As a check on the reasonableness of this number, we calculated outpatient treatment costs at M.D. Anderson Cancer Center to be about $480,735,000 in 1998. If this number is accurate it would account for about 34 percent of the outpatient cancer costs in the state, which we estimated by multiplying our estimate for Texas Oncology by four. The two entities between them would then account for almost 60 percent of all outpatient cancer treatment costs in Texas. We decided to use the figure of $1.427 billion as a reasonable estimate for outpatient treatment costs for cancer in Texas in 1998. This could not be broken out into the four main cancers of interest.

Emergency Services

The estimated cost of emergency services due to cancer, including both facility and physician costs, was about $17.7 million in 1998 (the estimate from MEPS was about $19 million—see Appendix A). Using

the same ratio, estimated costs of emergency services were $1.54 million for persons with colorectal cancer, $2.18 million for lung cancer, $872,000 for breast cancer, and $938,000 for prostate cancer.

Home Health Care

There is a lot of variability in home care organizations and it is difficult to obtain the exact number in the state. The term "home care organizations" includes home health agencies, home care aid organizations, and hospices that provide home care (discussed in the next section). The Texas Cancer Data Center estimates that there were 900 Class A licensed and/or JCAHO accredited home health agencies in 1998.[44] According to the Health Care Financing Administration, there were 1,580 certified home health agencies in Texas in 1998.[45] According to the 1997 U.S. Economic Census, there were 2,473 businesses in Texas categorized as "home health care services" that were subject to federal income taxes, and 187 in this category that were tax-exempt, for a total of 2,660.[46] Some home care organizations choose not to participate in Medicare, and some, such as home care aid organizations that do not provide skilled nursing care, are not eligible to participate. Of Medicare-certified agencies nationwide in 1998, 42 percent were freestanding proprietary agencies, 29 percent were hospital-based, 12 percent were public agencies, 8 percent were private non-profits, and the remaining 9 percent were voluntary organizations, rehab-based, nursing-home based, or other types.[47]

Home health services are used by patients with acute illness, long-term health conditions, permanent disability, or terminal illness. Nationally in 1997, the sources of payment for home care were as follows: Medicare–39.5 percent, Medicaid–14.7 percent, state and local government–7 percent, private insurance–11.4 percent, out-of-pocket–22.3 percent, and other sources–12.2 percent.[48] HCFA estimates that the amount spent in Texas in 1998 by all payers for home health care was $2.862 billion.[49] Applying 8.3 percent (the percentage of people discharged from home health care with malignant neoplasms as their primary diagnosis) to the total cost of home health care gave an estimate of $237.5 million attributable to cancer (the MEPS estimate was $332.1 million—see Appendix A). Breaking this percentage down further by types of cancer produced numbers too small to be reliable.

Hospice Care

Hospices provide supportive care to terminally ill patients and their families. Hospices can be hospital-based (about 25 percent nationally in 1998), home health agency-based (about 35 percent), skilled nursing facility-based (about 1 percent), or freestanding (independent, usually non-profit—about 39 percent). Most if not all are certified by Medicare, and these are the ones with data available.[50] Hospices must be Medicare-certified (meet the Medicare conditions of participation) to receive payments under Medicaid as well as Medicare, and services are often provided in the patients' homes. Services also may be provided in a hospital or other inpatient facility, or in nursing facilities (reimbursed by Medicaid but not Medicare).[51] The sources of payment for hospice care in 1995 were Medicare (65.3 percent), Medicaid (7.8 percent), private insurance (12 percent), and indigent care and other sources (14.9 percent).[52]

In Texas in 1997, there were 150 Medicare-certified hospices serving 25,451 patients. Their total reimbursements in 1997 were $154,796,000 (from Medicare, Medicaid, or private insurance).[53] We

obtained Medicare reimbursements for most Texas hospices for 1998, but could not obtain complete data so we used the 1997 data for this analysis.[*] In applying the national diagnosis data to the number of patients served by hospices in Texas in 1997, we estimate that 17,739 patients sought out hospice care due to some form of cancer. We could not break out colorectal cancer with the available data, but we calculated that 5,574 patients in Texas were served by hospices due to lung-related cancers, 1,120 due to breast cancer, and 840 due to prostate cancer. Applying the same percentages, we estimated that about $107.9 million was spent on hospice care for cancer patients in 1998. We cannot break out colorectal cancer costs, but we estimated that $33.9 million was spent due to lung-related cancers as the primary diagnosis, $6.8 million due to breast cancer, and $5.1 million due to prostate cancer.

Cancer Screening

Most people receive screening tests for one or more types of cancer as part of their routine physical examinations. For women these tests include mammograms for breast cancer, Pap smears for cervical cancer, and colonoscopies, sigmoidoscopies, and fecal occult blood tests for colorectal cancer. For men these include the prostate-specific antigen blood test (PSA) for prostate cancer and the same types of tests as women for colorectal cancer. Lung cancer screening is not routine for the general population.

The percentage of males and females age 40 and over reported having a fecal-occult blood test (FOBT) in the last year was 52.7 percent out of the 26.3 percent who had ever had one.[54] At an average cost of $11,[55] 1,013,402 people[56] receiving this test would cost about $11.1 million. We calculated that an estimated 100,440 people had a colonoscopy in 1998, so at an average cost of $1000 each,[57] the total cost for colonoscopies is estimated to be $100.4 million. The percentage of people who reported having a "sigmoidoscopy or proctoscopic exam" within the past year was 32.8 percent of the people who had ever had one (29.5 percent).[58] This equals about 707,475 people, and subtracting the people who had colonoscopies gives about 607,035 having sigmoidoscopies. Using an average cost of $237 for a sigmoidoscopy,[59] 607,035 people would cost about $143.9 million. Adding these three estimates gives a total cost of $255.5 million for colorectal cancer screening in 1998. Note that sigmoidoscopies and colonoscopies are not recommended to be given every year like the fecal occult blood test is (for people over 50), so this does not reflect the total number of people who may be following recommended guidelines.

There were 537 on-site mammography centers (approved by the American College of Radiology) in Texas in March of 1998.[60] In 1998 an estimated 1,945,139 women received mammograms (81.9 percent of women age 40 and over said they had "ever" had a mammogram, and 61.2 percent of these had one the previous year)[61] at an average cost of $106.[62] This gives an overall cost estimate of $206.2 million for mammograms in 1998. It was estimated that 2,365,657 women (73.8 percent of the 82.6 percent of women in Texas age 40 who had ever had a clinical breast exam) had a clinical breast exam in 1998.[63] We cannot assign an accurate cost to this component of breast cancer screening, as it is done by the

[*] We obtained Medicare reimbursements for 1998 through a Freedom of Information request to Palmetto GBA, the fiscal intermediary for a large majority of the hospices in Texas. The reports received had data for 142 hospices in Texas, with total charges of $91,407,312 and net reimbursements of $87,429,815 in 1998 (or parts of 1998, depending on the hospices' fiscal years). This is in line with the 1997 charges and reimbursements from NAHC if we assume Medicare is still the source for about 65 percent of payments, as noted for 1995.

physician as he/she is checking the rest of the body during a routine physical exam, but it generally takes only a few minutes so would not be a significant added cost.

Pap smears help detect early cervical cancer and pre-cancers and are one of the most effective cancer screening and prevention tools (cervical cancer incidence and deaths have decreased dramatically since the Pap test has become routine). In Texas for 1998, 66.4 percent of the 92.9 percent of women age 18 and over who reported ever having a Pap smear had one in 1998.[64] This translates to about 4,429,874 women.[65] At an average cost of $40,[66] the estimated total cost for Pap smears in 1998 was about $177.2 million. According to unpublished results from the Texas Department of Health's 1999 Behavioral Risk Factor Surveillance System survey, 30 percent of Texas men aged 40 and over (3,541,539) had a PSA test within the past year, equaling about 1,068,634 men.[67] The PSA test generally costs at least $25 per person,[68] so multiplying that cost by the number having the test equals about $26.7 million.

Retail Pharmaceuticals

In 1998, over 40,000 patients with a diagnosis of cancer were treated under Medicaid in Texas. The number of patients who obtained oncology drugs (see Appendix F for list of drugs) under the Medicaid Vendor Drug Program was 15,110, and the costs of these drugs for direct treatment was $9,643,368 in 1998. The total for other pharmaceuticals these same patients used for side effects and conditions related to the cancer and cancer treatment (see Appendix G for categories) was $9,801,254. Many other patients with a cancer diagnosis did not obtain their cancer-treatment drugs from the Vendor Drug Program (i.e., they obtained them in a hospital or doctor's office as opposed to a retail pharmacy), but did obtain related drugs through this program: an additional 26,776 patients with costs of $9,596,629 for related drugs. This brings the cost of oncology drugs plus related drugs obtained through the Texas Medicaid vendor drug program for these 41,886 patients to $29,041,251.[69]

This gives a total per capita estimated cost of relevant retail pharmaceuticals of $693.34 for these cancer patients getting drugs through Medicaid. An estimated 200,000 people in Texas received cancer treatments in 1998, so multiplying this number by the per capita estimated cost shown under Medicaid gives an estimate of $138.7 million for related retail pharmaceuticals for all cancer patients in Texas in 1998. Since the same drugs may be used to treat different cancers and side effects, we cannot use this data to assign specific costs to the four target cancers.

State Agency Budgets

Several state agencies are partially or totally devoted to cancer prevention, detection, and/or education, so we included their fiscal year 1998 budgets as a direct cost of cancer. These include the Texas Cancer Council with a FY98 budget of $4,002,544,[70] and several programs within the Texas Department of Health. These include the TDH Breast and Cervical Cancer Control Program with a FY98 budget of $5,239,818; the Cancer Registry Division (in the Bureau of Epidemiology), $1,669,089; the cancer prevention component of the Chronic Diseases Community and Worksite Wellness Division, $452,761; the cervical cancer component of the Maternal Health Program, $1,145,883; the Medical Transportation Program (has cancer transportation programs in seven Texas counties), $291,528; the Prostate Cancer

Education Program, $12,151; and the tobacco portion of the Bureau of Disease, Injury, and Tobacco Prevention with a budget of $1,271,179.[71] The total of these budgets for FY98 is $14,084,953, which is a conservative estimate as there are probably additional programs. This number cannot be reliably broken out into the four target cancers, since most budgets contain programs addressing several cancers or all cancers.

Non-Profits and Foundations

There are 124 foundations in the state of Texas that fund cancer research and/or treatment in some capacity. Although it is difficult to calculate their financial impact for various reasons, foundations as well as the non-profit sector are important components in cancer control in the state. With the rising numbers of cancer cases and treatment costs, these organizations will play a larger role in the cancer field. For example, in Austin there is research being done by a foundation to develop a community center for cancer patients and survivors that would offer activities such as support groups, exercise, and nutrition classes. Also, large organizations such as the American Cancer Society, the Susan G. Komen Foundation, and many others have contributed to research that has made a difference in the management and treatment of cancer.

For this study, we included only a few of the larger non-profits and foundations in Texas whose sole purpose is to serve cancer patients and survivors. These include the Lance Armstrong Foundation, with a 1998 budget of $344,622,[72] the Susan G. Komen Foundation, whose 1998 budget in Texas was $3,260,559,[73] and the American Cancer Society, whose 1998 Texas budget was $19,289,552.[74] The Candlelighters organization is very active in Texas, but their structure makes is difficult to determine costs. These three budgets total $22,894,773 for 1998. We cannot break out this amount by specific types of cancer as most organizations are concerned with more than one type of cancer.

Total Direct Costs and Breakdown

Using the numbers calculated in the preceding sections, we estimate the total direct cost of cancer in Texas in 1998 to be about $4.76 billion. We estimate that this includes at least $453 million attributable to colorectal cancer, $313 million to lung cancer, $325 million to breast cancer, and $152 million to prostate cancer, which are conservative estimates as many direct costs could not be broken out into these specific cancers. See Table 2 for details.

Table 2. Summary of Estimated Direct Costs of Cancer in Texas, 1998

Cost Component	Total, All Cancers (x $1,000)	Colorectal Cancer (x $1,000)	Lung Cancer (x $1,000)	Breast Cancer (x $1,000)	Prostate Cancer (x $1,000)
Hospitals	$1,852,574	$161,428	$228,049	$91,272	$98,157
Inpatient Physicians	$277,886	$34,868	$49,258	$19,715	$21,202
Emergency Services	$17,709	$1,543	$2,180	$872	$938
Outpatient Treatment	$1,427,000	n/a	n/a	n/a	n/a
Home Health	$237,546	n/a	n/a	n/a	n/a
Hospice Care	$107,893	n/a	$33,900	$6,811	$5,108
Cancer Screening	$665,551	$255,455	n/a	$206,185	$26,716
Retail Pharmaceuticals	$138,668	n/a	n/a	n/a	n/a
State Agency Budgets	$14,085	n/a	n/a	n/a	n/a
Nonprofits and Foundations	$22,895	n/a	n/a	n/a	n/a
TOTALS	**$4,761,807**	**$453,294**	**$313,387**	**$324,855**	**$152,121**

Note: "n/a" means "not available"

Findings: Indirect Costs

Morbidity/Disability

An estimated 247,000 Texans in 1998 had some history of cancer and an associated short-term or long-term disability (see Table 3). The estimated cost of that disability was about $4.1 billion in lost productivity. An estimated 46,000 women had some disability due to breast cancer, with an estimated cost of about $486 million. Disability due to lung cancer was less common (30,000), but the social cost was higher ($643 million). Disability from colorectal and prostate cancers cost about $283 million and $204 million respectively. Thus, the four specific types of cancer accounted for about 39 percent of the total disability costs of cancer in Texas.

The reader should note that the national survey data used for these estimates have relatively few respondents with any of the specific types of cancers studied, and even fewer have any associated disability. Thus, the confidence intervals associated with the cost estimates are quite wide.

Table 3. Estimated People Disabled due to Cancer and Costs of Lost Productivity, Texas, 1998

	Disabled due to Cancer			Lost Productivity	
	Persons	**Prevalence**	**95% C.I.**	**Cost (x $1,000)**	**95% Relative C.I.**
Any Cancer (ICD 140-208)	247,000	1.26%	+/-0.13%	$4,143,514	+/- 11%
Colorectal (ICD 153-4)	17,000	0.09%	+/-0.05%	$283,384	+/- 64%
Trachea, Bronchus, Lung (ICD 162)	29,000	0.15%	+/-0.06%	$642,817	+/- 43%
Female Breast (ICD 174)	46,000	0.23%	+/-0.07%	$486,444	+/- 29%
Prostate (ICD 185)	12,000	0.06%	+/-0.04%	$203,553	+/- 62%

Sources:
National Health Interview Surveys, 1987-96. National Center for Health Statistics.
Dorothy P. Rice, Wendy Max, and Martha Michel. "Present Value of Lifetime Earnings and Housekeeping Services, U.S." Unpublished tables, Institute for Health and Aging, University of California, San Francisco, 2000.
Bureau of Labor Statistics and Bureau of the Census, U.S. Department of Commerce.
1998 population data: Texas State Data Center, Texas A&M University.

***Notes**:*
"Any cancer" is defined as malignant neoplasms. However, in survey situations, respondents are likely to also report benign neoplasms.
Disability defined as unable to work, work loss days, or bed days with cancer as main cause.
Prevalence estimates for gender-specific cancers use total population as denominator.
C.I. = Confidence Interval.

Mortality

More than 32,000 people in Texas died from cancer in 1998, with the four specific cancers of interest accounting for more than half of the deaths (see Table 4). Lung cancer was by far the most common cause of death, and it accounted for about 30 percent of all cancer deaths. Cancer deaths in 1998 were associated with almost half a million years of life lost, with the four specific cancers accounting for half of the total. The reader should note that the specific types of cancer differ in terms of their impact on years of life lost. For example, the average death from breast cancer was estimated to result in 20 years of life lost, compared to prostate cancer where the average death resulted in about eight years of life lost.

The estimated 1998 present value of future losses in productively due to cancer mortality was almost $5 billion. About 25 percent ($1.2 billion) of the costs were associated with lung cancer. Colorectal and breast cancer cost about $460 million and $440 million, respectively. Prostate cancer had an estimated cost of about $90 million. Table 5 breaks this information out by public health region.

Table 4. Estimated Number of Deaths, Years of Life Lost, and Costs of Lost Productivity Due to Cancer Mortality in Texas, 1998, by Age Group

Age Group	All Cancers ICD 140-208	Colorectal ICD 153-4	Lung ICD 162	Breast ICD 174-5	Prostate ICD 185
Number of Deaths					
0-14	124	0	2	0	0
15-29	264	16	5	9	0
30-44	1,428	134	191	248	1
45-59	5,447	507	1,527	677	67
60-74	12,513	1,127	4,564	767	532
75+	12,499	1,492	3,224	786	1,295
Total	**32,275**	**3,276**	**9,513**	**2,487**	**1,895**
Years of Life Lost					
0-14	8,600	0	100	0	0
15-29	14,200	800	300	500	0
30-44	55,800	5,200	7,200	10,300	0
45-59	143,900	13,200	38,800	19,800	1,500
60-74	189,300	17,200	68,000	13,200	7,000
75+	68,900	8,400	17,500	4,800	6,300
Total	**480,700**	**44,800**	**131,800**	**48,500**	**14,800**
Costs of Lost Productivity (x $1,000)					
0-14	110,343	0	1,665	0	0
15-29	284,587	16,886	5,862	7,855	0
30-44	1,143,212	109,720	157,515	159,603	930
45-59	2,280,012	226,749	636,086	215,355	30,046
60-74	1,079,004	98,356	401,364	50,974	49,218
75+	77,665	8,978	20,594	3,950	9,571
Total	**$4,974,822**	**$460,689**	**$1,223,085**	**$437,737**	**$89,764**

***Sources**:*

1998 population data: Texas State Data Center, Texas A&M University.

Dorothy P. Rice, Wendy Max, and Martha Michel. "Present Value of Lifetime Earnings and Housekeeping Services, U.S." Unpublished tables, Institute for Health and Aging, University of California, San Francisco, 2000.

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Texas Department of Health, Bureau of Vital Statistics. "1998 Texas Life Tables," webpage located at http://www.tdh.state.tx.us/bvs/stats98/ANNR_HTM/98t24.HTM.

Table 5. Number of Deaths, Years of Life Lost, and Estimated Costs of Lost Productivity Due to Cancer Mortality in Texas Public Health Regions, 1998

PHR	Cause	Deaths	Years of Life Lost	Costs
Region 1	All Cancer Deaths	1,422	19,300	$178,972,000
	Colorectal Cancer	147	1,800	15,544,000
	Lung Cancer	414	5,600	49,187,000
	Breast Cancer	105	1,800	14,838,000
	Prostate Cancer	108	800	5,177,000
Region 2	All Cancer Deaths	1,312	17,200	$154,287,000
	Colorectal Cancer	147	1,600	11,796,000
	Lung Cancer	398	5,000	39,198,000
	Breast Cancer	101	1,700	13,046,000
	Prostate Cancer	87	700	3,611,000
Region 3	All Cancer Deaths	7,583	118,000	$1,275,548,000
	Colorectal Cancer	832	11,900	130,238,000
	Lung Cancer	2,256	33,300	326,604,000
	Breast Cancer	582	11,700	109,742,000
	Prostate Cancer	417	3,300	20,857,000
Region 4	All Cancer Deaths	2,454	33,700	$328,769,000
	Colorectal Cancer	253	3,200	32,688,000
	Lung Cancer	795	10,800	103,571,000
	Breast Cancer	170	2,900	23,780,000
	Prostate Cancer	164	1,300	7,299,000
Region 5	All Cancer Deaths	1,916	26,900	$258,334,000
	Colorectal Cancer	172	2,200	19,922,000
	Lung Cancer	616	8,400	74,334,000
	Breast Cancer	107	2,000	17,433,000
	Prostate Cancer	121	900	5,270,000
Region 6	All Cancer Deaths	6,616	105,800	$1,174,907,000
	Colorectal Cancer	652	9,400	103,225,000
	Lung Cancer	2,005	29,600	295,035,000
	Breast Cancer	563	11,600	108,132,000
	Prostate Cancer	358	2,900	17,760,000
Region 7	All Cancer Deaths	3,349	48,500	$493,187,000
	Colorectal Cancer	362	5,000	53,289,000
	Lung Cancer	1,003	13,600	122,010,000
	Breast Cancer	257	5,100	47,039,000
	Prostate Cancer	195	1,500	8,683,000
Region 8	All Cancer Deaths	3,510	51,400	$520,490,000
	Colorectal Cancer	324	4, 000	36,869,000
	Lung Cancer	957	12,300	106,573,000
	Breast Cancer	276	5,300	48,120,000
	Prostate Cancer	203	1,600	10,148,000
Region 9	All Cancer Deaths	1,026	14,000	$123,387,000
	Colorectal Cancer	106	1,500	16,092,000
	Lung Cancer	317	4,200	33,666,000
	Breast Cancer	91	1,700	15,162,000
	Prostate Cancer	66	500	2,668,000
Region 10	All Cancer Deaths	924	15,000	$149,990,000
	Colorectal Cancer	95	1,400	13,746,000
	Lung Cancer	190	2,200	15,106,000
	Breast Cancer	85	1,600	13,266,000
	Prostate Cancer	51	300	1,410,000
Region 11	All Cancer Deaths	2,163	31,300	$316,952,000
	Colorectal Cancer	186	2,600	27,281,000
	Lung Cancer	562	6,900	57,802,000
	Breast Cancer	150	3,000	27,178,000
	Prostate Cancer	125	1,000	6,883,000

Findings: Total Estimated Economic Impact of Cancer in Texas in 1998

The total estimated cost of cancer in Texas in 1998 was about $13.9 billion, including direct costs of about $4.8 billion (see Table 2) and indirect costs of about $9.1 billion (see Table 3 for morbidity and Table 4 for mortality). This is broken out by the four most common cancers in Table 6. The distribution of costs for each of the types of cancer partly stems from the types of health care items measured in this study, and partly results from the nature of the diseases. Costs associated with lung cancer were largely associated with mortality and were proportionately small for medical treatment. Disability costs were proportionately high for prostate cancer and breast cancer.

Table 6. Summary of Estimated Total Costs of Cancer in Texas, 1998

	Direct Costs (x $1,000) and % of whole	Morbidity (x $1,000) and % of whole	Mortality (x $1,000) and % of whole	Total (x $1,000) and % of whole
Total, All Cancers	**$4,761,807 (34.3%)**	**$4,143,514 (29.9%)**	**$4,974,822 (35.9%)**	**$13,866,565 (100%)**
Colorectal Cancer	$453,294 (3.3%)	$283,384 (2.0%)	$460,689 (3.3%)	**$1,221,171 (8.8%)**
Lung Cancer	$313,387 (2.3%)	$642,817 (4.6%)	$1,223,085 (8.8%)	**$2,179,289 (15.7%)**
Breast Cancer	$324,855 (2.3%)	$486,444 (3.5%)	$437,737 (3.2%)	**$1,249,036 (9.0%)**
Prostate Cancer	$152,121 (1.1%)	$203,553 (1.5%)	$89,764 (0.6%)	**$445,438 (3.2%)**

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APPENDIX A

Data from the Medical Expenditure Panel Survey

The Medical Expenditure Panel Survey (MEPS) is a national survey of medical expenses among the U.S. population in 1996. The survey had a complex multi-stage sampling frame with 21,571 individuals participating. Of these, 1,089 had some history of cancer, including both malignant and benign conditions. When benign cancers are excluded, 777 individuals had some history of cancer.

Information from the survey is potentially useful for estimating some of the costs of cancer provided that the researcher is cognizant of the limitations of the data. First, there is the problem of sample size. The number of respondents with a history of cancer is reasonable for estimating total cost, and possibly reasonable for estimating costs for a particular payer or for a particular type of service. However, the number of respondents with a history of cancer who used a particular type of service and had coverage by a particular payer is likely to be very small. Also, the number of individuals with a history of a particular type of cancer may be small.

Second, there is the issue of transporting national survey data to Texas. The Texas population differs from the U.S. population, primarily because of the presence of the large Hispanic population. The cancer profile for Hispanic population is known to differ from that of the U.S. population in terms of incidence, access to care, and mortality.* Consequently, national survey data, however stratified, may not apply to the Texas population. Also, the structure of the Texas health care system differs from that of the U.S., and costs for the various services tend to be lower.

The following table provides cost estimates for cancer in Texas. The estimates are based on the U.S. national MEPS for 1996. Calculations are based on "attributable risk," that is, the calculations consider the differences in average cost between persons with and without a history of cancer. That difference is assumed to be attributable to cancer. The calculations are weighted to the U.S. national population in 1996, then adjusted to the Texas population estimated as of mid-1998. An additional adjustment considers that cancer incidence rates in Texas are about 85 percent of national figures, primarily because the Texas population is younger that the national population. No adjustment is made to inflate cost figures from 1996 to 1998, nor for the relative costs of care in Texas and the U.S., primarily because those two items will balance each other out, and also because such adjustments would presume levels of accuracy and precision which do not exist. Also, the tables do not provide confidence intervals, primarily because such calculations would apply to the U.S. population and not necessarily to the Texas population.

**See, for example:*

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Appendix A, continued

The reader will note that some cells contain negative numbers. It is possible that a person with cancer might cause a shifting of costs. For example, an individual with Medicaid who is diagnosed with cancer might become eligible for Medicare, thus resulting in a net saving to Medicaid. More likely, however, the negative numbers result simply from sampling error and the formula employed for calculating attributable risk.

Estimated Attributable Costs of Cancer in Texas, 1998

	Private Insurance	Medicare	Medicaid	Other	Total	Percent
PERSONS WITH ANY CANCER HISTORY						
Hospital Inpatient Facility	650,116,956	1,098,901,213	200,427,041	36,746,797	**1,986,192,007**	46%
Hospital Inpatient Physician	131,117,824	63,101,950	13,160,451	9,628,209	**217,008,434**	5%
Hospital Outpatient Facility	205,585,922	144,823,176	3,271,618	78,398,403	**432,079,119**	10%
Hospital Outpatient Provider	68,984,935	53,559,352	2,522,691	12,318,815	**137,385,792**	3%
Hospital Emergency Facility and Physician	1,093,025	28,264,191	-1,503,415	-8,867,865	**18,985,936**	0%
Office-Based - Physician and Non-Physician	337,527,880	209,951,528	5,673,219	105,222,024	**658,374,650**	15%
Home Health	28,760,912	171,469,470	13,549,626	118,314,284	**332,094,293**	8%
Equipment/Supplies	23,219,251	19,206,943	-151,432	36,091,641	**78,366,404**	2%
Prescriptions	155,317,001	9,841,884	3,824,812	182,091,843	**351,075,540**	8%
All Other	18,662,764	769,391	-3,252,106	99,305,005	**115,485,054**	3%
Total	**1,620,386,469**	**1,799,889,098**	**237,522,505**	**669,249,155**	**4,327,047,228**	100%
Percent	37%	42%	5%	15%	100%	
PERSONS WITH ANY NON-BENIGN CANCER HISTORY						
Hospital Inpatient Facility	625,153,864	1,119,675,055	216,727,964	28,263,234	**1,989,820,116**	50%
Hospital Inpatient Physician	123,350,285	65,405,551	14,603,405	6,454,916	**209,814,156**	5%
Hospital Outpatient Facility	169,709,030	135,774,241	3,734,104	70,335,868	**379,553,243**	10%
Hospital Outpatient Provider	49,354,707	50,131,572	2,669,692	8,808,625	**110,964,596**	3%
Hospital Emergency Facility and Physician	2,821,215	28,838,813	33,055	-6,475,135	**25,217,948**	1%
Office-Based - Physician and Non-Physician	252,180,927	201,664,802	11,896,440	80,841,293	**546,583,462**	14%
Home Health	31,377,768	186,969,175	19,043,766	112,339,002	**349,729,711**	9%
Equipment/Supplies	23,156,564	19,637,477	685,661	30,125,726	**73,605,429**	2%
Prescriptions	124,026,878	4,263,246	8,310,437	154,039,286	**290,639,847**	7%
All Other	-4,707,910	772,561	-2,109,046	15,430,965	**9,386,569**	0%
Total	**1,396,423,328**	**1,813,132,492**	**275,595,478**	**500,163,780**	**3,985,315,078**	100%
Percent	35%	45%	7%	13%	100%	

Source: U.S. Medical Expenditure Panel Survey, 1996.

APPENDIX B

Review of SAMMEC Methodology

The Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC) software package was developed by the Office of Smoking and Health of the National Center for Chronic Disease Prevention and Health Promotion at the CDC. The package was developed to help states and large cities to estimate the effects of smoking. The software addresses cancer costs when attributable to tobacco, but it does not directly deal with costs of cancers due to other causes.

In the current version 3.0, the software can be used to estimate smoking-attributable mortality, years of life lost, and costs of premature mortality. The economic portion of the calculations employs the "human capital approach" in that loss in life is valued in terms of present value of future losses in productivity if the deceased had survived to average life expectancy. Future versions of the software will address lost productivity from disability and direct costs of health care attributable to smoking.

The software comes with a complete set of raw data for the United States overall, but would need addition of data specific to Texas. It employs a set of input tables to generate output tables, and it offers some graphic output as well. The following are descriptions of the input tables:

- Study population by gender in 5-year age groups beginning at age 35.
- A standard population for comparisons, also by gender and 5-year age groups.
- Years of potential life remaining in the study population for the same groups.
- Number of deaths from 27 causes of death by gender and age groups, including infants for five causes and persons under age 35 for burns. The causes of death include eight categories of cancer. Causes of death not strongly associated with smoking are not included in the table.
- Current and former smoking prevalence estimates for men and women, and for ages 35-64 and 65 and over, respectively; also includes smoking prevalence among pregnant women.
- Relative risk estimates for male and female current and former smokers (and for infants) for the various causes of death.
- Estimates of present value of future earnings by gender and 5-year age groups. The estimates employ a discount rate of 2 percent and assume a 1 percent annual increase in productivity.

For use in Texas, some modification of the raw data would be necessary. However, most of the needed information is readily available: population, deaths, and life expectancy data. Smoking prevalence estimates for Texas can be drawn from the Behavioral Risk Factor Survey. Relative risk data need not be modified. Some adaptation would be needed to generate lifetime earning figures appropriate to Texas.

Appendix B, continued

The major output tables are the following:

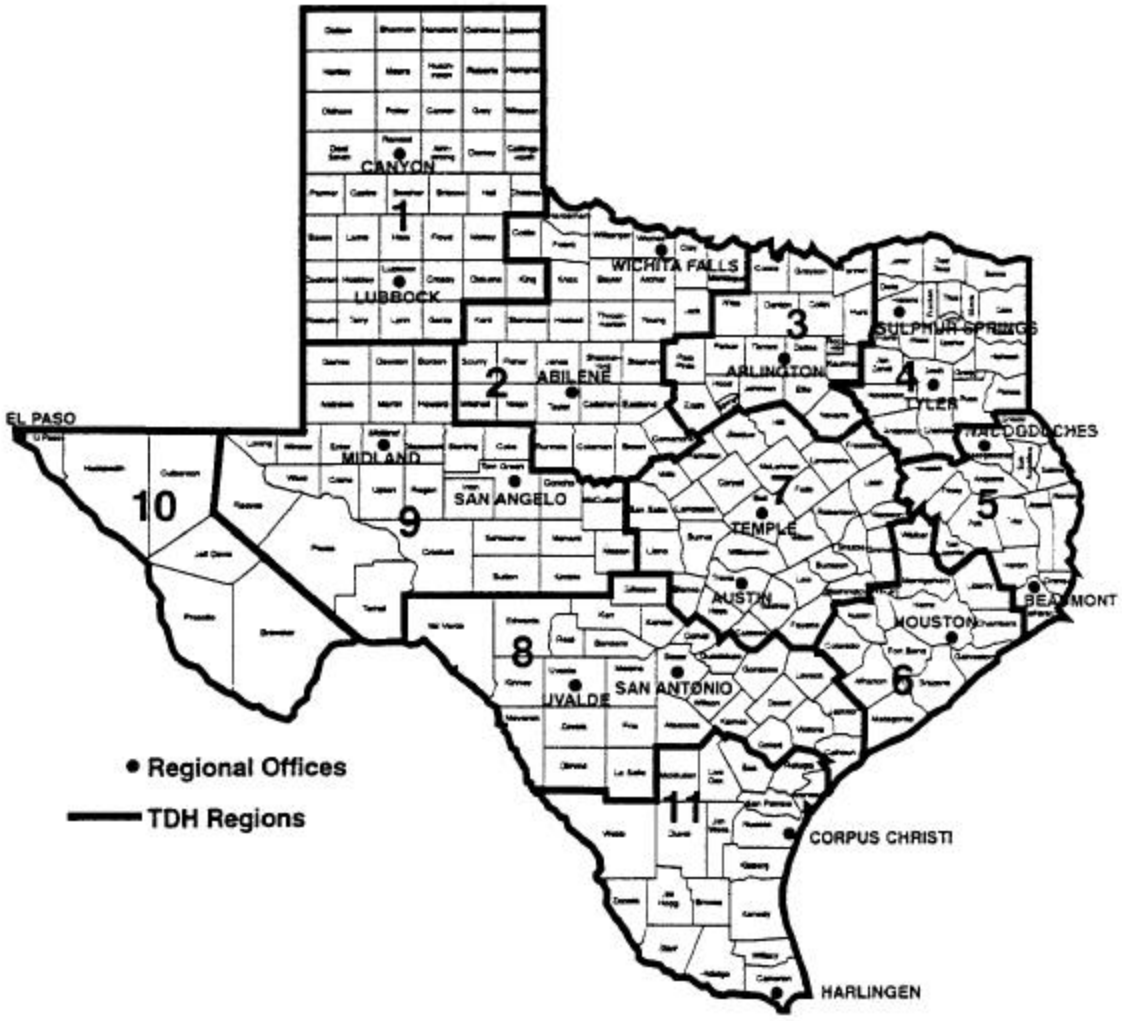
- Number of smoking-attributable deaths by cause, age, and gender (including rates, and fractions of all deaths within the listed causes).
- Years of potential life lost by cause, age, and gender (including standardization against a comparison population).
- Smoking-attributable costs by cause, age and gender.

The software has some limitations. The documentation advises that the calculations should not be applied to populations smaller than 500,000, and suggestion is made that multi-year averages can yield more stable estimates. A particular concern is that the software does not deal with statistical errors that might arise from the estimates of smoking prevalence and from the relative risk figures. Thus, the output does not provide confidence intervals. Finally, there is some potential for error arising from the relative risk figures to the extent that the relative risks in Texas differ. For example, a higher mortality from cervical cancer, even in the absence of smoking, might mean that the relative risk for smoking-attributable cervical cancer differs from the figures provided with the software package. Nevertheless, even if cervical cancer risk is higher, it is also likely that smoking increases the risk proportionately.

As explained earlier, the software does not directly estimate costs for all deaths from a given cause, say, lung cancer.

APPENDIX C

Map of Texas Department of Health
Public Health Regions



APPENDIX D

Ratios of Medicare Inpatient Physician to Facility Costs for Selected DRGs

DRG	N	Mean	Std Deviation
1	1264	0.2620	0.1456
10	646	0.2607	0.1576
75	1405	0.2259	0.1037
76	1359	0.2151	0.1042
82	2087	0.2321	0.1345
89	13654	0.1854	0.1028
148	4464	0.2074	0.0998
172	960	0.2320	0.1294
173	73	0.2525	0.1613
188	2410	0.2546	0.1438
203	922	0.2315	0.1253
237	55	0.3060	0.1769
238	233	0.2029	0.1332
239	1711	0.2396	0.1343
296	6856	0.2285	0.1333
303	666	0.2817	0.1226
358	710	0.3057	0.1413
359	861	0.3694	0.1525
395	2347	0.2184	0.1410
398	628	0.1609	0.1117
403	1183	0.2048	0.1347
410	1638	0.1230	0.1046
416	6325	0.2005	0.1168
481	10	0.0517	0.0267
492	105	0.0675	0.0426

Source: Zwanziger, Jack, Associate Professor, Department of Community and Preventive Medicine, University of Rochester. Personal e-mail to David C. Warner. January 1, 2001.

Note: "N" refers to the number of cases employed in the source study, not to the number of hospital cases in Texas.

APPENDIX E

Freestanding Cancer Centers in Texas, March 1998

Cancer Center	City
North Texas Cancer Treatment Center	Denton
El Paso Cancer Treatment Center	El Paso
Arlington Cancer Center	Arlington
Shivers Cancer Center	Austin
Cancer Therapy and Research Center	San Antonio
Allison Cancer Center	Midland
The Don and Sybil Harrington Cancer Center	Amarillo
M.D. Anderson Cancer Network—Tarrant County	Fort Worth
Austin Cancer Center	Austin
Houston Northwest Radiotherapy Center	Houston
Live Oak Regional Cancer Center	San Antonio
Regional Cancer Treatment Center	San Angelo
North Texas Regional Cancer Center	Plano
Cancer Center of Port Arthur	Port Arthur
Radiation Therapy Center	Houston
Kelsey-Seybold Cancer Prevention Center	Houston
Texas Cancer Center-Sherman	Sherman
Northwest Outpatient Cancer Center	Houston
St. Joseph Regional Cancer Center	Bryan
Kerrville Radiation Therapy Center	Kerrville
Houston Cancer Institute	Houston
Bellaire Cancer Treatment Center	Houston
Paris Regional Cancer Center	Paris
Southwest Regional Cancer Center	Austin
Brazosport Cancer Center	Lake Jackson
Texas Oncology Physician Associates	Dallas
South Texas Cancer Center	McAllen
Longview Cancer Center	Longview
North Austin Cancer Center	Austin
Texas Cancer Center—Abilene South	Abilene

Source: Texas Cancer Data Center

APPENDIX F

Oncology Drugs included in Retail Pharmaceutical Costs

American Hospital Formulary System Code 100000

Aclarubicin HCL
Aldesleukin
Altretamine
Amsacrine
Anastrozole
Asparaginase
Bendamustine HCL
Bexarotene
Bicalutamide
Bleomycin Sulfate
Bleomycin Sulfate/Lidocaine HC
Buserelin Acetate
Busulfan
Capecitabine
Carboplatin
Carmustine
Carmustine/Polifeprosan 20
Chlorambucil
Cisplatin
Cladribine
Corynebacterium Parvum
Cyclophosphamide
Cyclophosphamide/Dex-Water
Cyclophosphamide/Na Chlor 0.9%
Cyproterone Acetate
Cytarabine
Cytarabine Liposome
Dacarbazine
Dactinomycin
Daunorubicin Citrate Liposomal
Daunorubicin HCL
Denileukin Diftitox
Dhs/Phthalylsulfathiazole/Niac
Docetaxel
Docetaxel Anhydrous
Doxorubicin HCL
Doxorubicin HCL Liposomal
Dromostanolone Propionate
Elliptinium Acetate
Epirubicin HCL
Epirubicin HCL/Ethiodized Oil
Erwinia Asparaginase
Estramustine Phosphate Sodium
Ethoglucid
Etoposide
Etoposide Phosphate
Exemestane
Floxuridine
Fludarabine Phosphate
Fluorouracil
Flutamide
Formestane
Fotemustine
Gemcitabine HCL
Gemtuzumab Ozogamicin
Goserelin Acetate
Hydroxyurea
Idarubicin HCL
Ifosfamide
Ifosfamide/Mesna
Interferon Alfa-2a,Recomb.
Interferon Alfa-2b,Recomb.
Interferon Alfa-N1
Interferon Alfa-N3
Interferon Alfacon-1
Interferon Gamma-1b,Recomb.
Irinotecan HCL
Letrozole
Leuprolide Ac (Obsolete)
Leuprolide Acetate
Levamisole HCL
Lomustine
Mechlorethamine HCL
Megestrol Acetate
Melphalan
Melphalan HCL
Mercaptopuril
Methotrexate
Methotrexate Sodium
Mistletoe
Mitobronitol
Mitomycin
Mitotane
Mitoxantrone HCL
Na Rep 0.9%/Bcg Vaccine
Nilutamide
Nimustine HCL
Oxaliplatin
Paclitaxel
Paclitaxel,Semi-Synthetic
Pegaspargase
Pentostatin
Pipobroman
Pirarubicin
Plicamycin
Porfimer Sodium
Prednimustine
Procarbazine HCL
Raltitrexed
Razoxane
Rituximab
Streptozocin
Tamoxifen Citrate
Tegafur
Tegafur/Uracil
Temozolomide
Teniposide
Testolactone
Thioguanine
Thiotepa
Topotecan HCL
Toremifene Citrate
Trastuzumab
Treosulfan
Tretinoin
Triptorelin
Triptorelin Acetate
Trofosfamide
Trypsin/Chymotrypsin/Papain
Uracil Mustard
Valrubicin
Vinblastine Sulfate
Vincristine Sulfate
Vindesine Sulfate
Vinorelbine Tartrate

APPENDIX G

Other Drugs Related to Cancer and Treatment included in Retail Pharmaceutical Costs

American Hospital Formulary System Code and Description

081202	aminoglycosides
081204	antifungal antibiotics
081206	cephalosporins
081207	b-lactam antibiotics
081212	macrolides
081216	penicillins
081224	tetracyclines
081228	miscellaneous antibiotics
082200	quinolones
082400	sulfonamides
082600	sulfones
083600	urinary anti-infectives
200404	iron preparations
201204	anticoagulants
201216	hemostatics
201600	hematopoietics
280804	nsaids
280808	opiate agonists
280812	opiate partial agonists
280892	miscellaneous analgesics
281000	opiate antagonists
281204	barbiturates
281208	benzodiazepines
281212	hydantoins
281220	succinimides
281292	miscellaneous anticonvulsants
282492	miscellaneous anxiolytics
400400	acidifying agents
400800	alkalinizing agents
401000	ammonia detoxificants
401200	replacement preparations
401800	potassium-removing resins
402000	caloric agents
402400	salt and sugar substitutes
520405	antifungals
560800	anti-inflammatory agents
561200	cathartics and laxatives
561400	cholelitholytic agents
561600	digestants
562200	antiemetics
680400	adrenals
840404	skin anti-infectives